

EXPLANATION OF PLATE I.

In all figures only a portion of the terga (which are symmetrical) has been shown, since the missing portions are exactly like those figured.

Fig. 1. Terga and wing bases of a Plecopteron.

Fig. 2. Terga and wing bases of the Coleopteron *Photuris*.

Fig. 3. Terga and wing bases of *Embia major*.

Fig. 4. Terga and wing bases of the Dermapteron *Echinosoma*.

ON THE OCCURRENCE OF A MERMIS EPIDEMIC
AMONGST GRASSHOPPERS.¹

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While engaged in some investigations on grasshoppers, near Dummerston Station, southern Vermont, this past summer (1917), our attention was attracted to a high mortality amongst these insects (*Melanoplus atlanis* and *M. bivittatus*). The two species, especially *M. atlanis*, are extremely bad pests in this region of the country, attacking corn, wheat, oats and clover to such an extent that during certain summers the farmers become nearly frantic. Therefore, the high mortality amongst the grasshoppers, which appeared during the latter part of August and the early part of September, was exceedingly gratifying.

We soon discovered that this mortality was due to a species of Nematode belonging, as we supposed at the time, probably to the family Mermithidæ. Subsequently (Sept. 20, 25 and Oct. 6), we sent large shipments of these worms to Dr. N. A. Cobb, of Washington, D. C., for identification. Dr. Cobb was able to give us only a provisional identification on account of the utter absence of males in all of our shipments. We made collections of parasitized grasshoppers from a large variety of fields and as stated, sent a large number of specimens, but curiously enough no males were found. Dr. Cobb in a letter said: "Nothing I have learned would preclude your specimens from belonging to the same species as that referred to by Leidy under the name of *Mermis ferruginea*, which

¹ Contribution from the Entomological Laboratory of the Bussey Institution in coöperation with the U. S. Bureau of Entomology. Bussey Institution, No. 146.

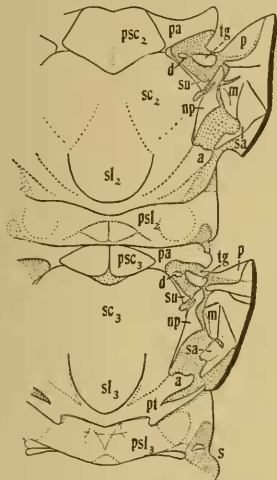


Fig. 1

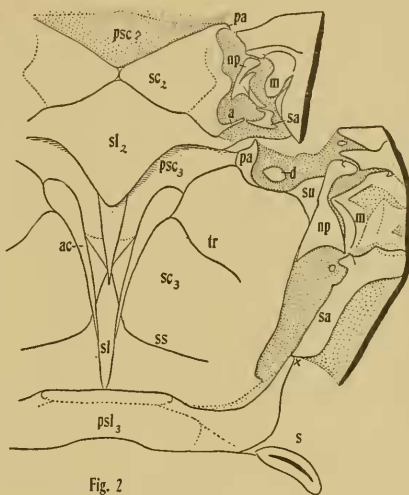


Fig. 2

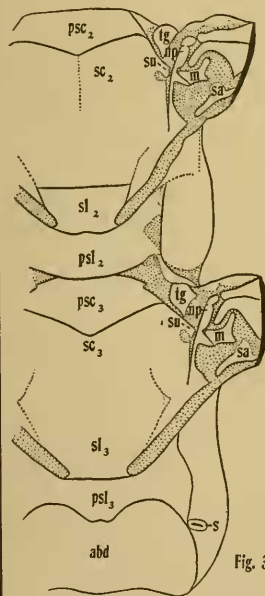


Fig. 3

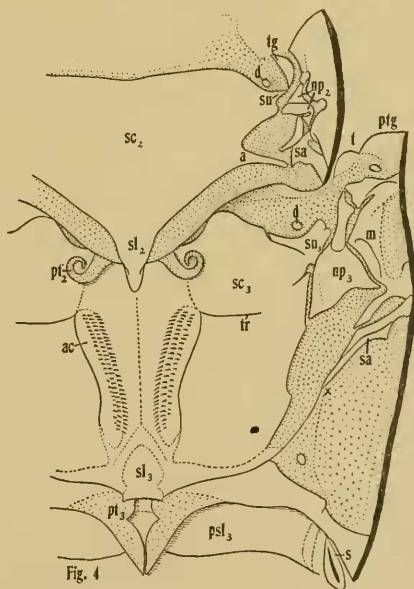


Fig. 4

he says was common in *Locusta carolina* near Philadelphia; but there can be no certainty about the matter until males of the present species are obtained and a comparison made with Leidy's material, which may or may not be in existence." Dr. Cobb further stated that after the nematodes leave the grasshoppers, they make their way into the soil and that their further history is obscure.

In Vermont the nematodes parasitized both *M. atlantis* and *M. bivittatus*. The worms seem to leave the bodies of the grasshoppers when these insects are maturing. We had not the opportunity to observe grasshoppers in the early stages of parasitism, but in August and September dissection of a large number of the insects showed that the worms were located within the body cavity. Later in the season, when the worms are about to emerge, the grasshoppers fall over on one side, kick for a time and then die. In the meantime, the worms gradually bore their way through the body wall and reach the exterior after which they make their way slowly into the earth. Usually only one worm parasitizes a grasshopper, but by dissection we have often found two or three and in one case we found forty. Needless to say, that when an insect contains so many worms the abdomen is considerably swollen.

The length of these female worms varied from two to eight inches. It is extraordinary that with hundreds of hoppers dying everywhere, we were unable to find any males.

A great many nematodes, at one stage of their life cycle, seek water on leaving their hosts and there mature, or wait until another host presents himself. We placed about two dozen of our worms in a bowl of water in which they seemed to flourish for about two weeks. However, the localities where the hoppers, and consequently the worms abounded were free from streams, ponds or marshes of any kind. The Connecticut River flows through a valley at a distance of about one-half mile so it seemed unlikely that the worms would travel so far. In all probability, we thought, the worms make their way into the soil on leaving the insects and this we found true. We placed recently dead parasitized hoppers in boxes containing earth. In about three days the boxes were examined and the worms were found coiled up at a depth of about one foot. Often a number would be coiled up together in one